



# The Seating Series

A seating and wheeled mobility resource for therapists

## Special points of interest:

- > Information sharing for a wide variety of seating and mobility topics
- > Created for therapists, by therapists
- > Something for everyone whether your seating skills are basic, intermediate, or advanced
- > Published quarterly and available free electronically

## Inside this issue

Reader's Reviews	2
Spotlight On . . . Dynamic Tilt-in-space	3
A Worthy Excerpt: Tilt vs Recline	4
Hands On! Assessing for Dynamic Tilt in Space . . . Basic	5
Hands On! Assessing for Dynamic Tilt in Space . . . Intermediate	7
Hands On! Assessing for Dynamic Tilt in Space . . . Advanced	8
Know Your Product	11
The "Load" Down on Pressure	12
Seating Myth busters	14
Seating Solutions	15
Ask the Expert	16
Online and at Your Fingertips	17
Different Settings, Different Strategies: Implementing Tilt Across the Continuum of Care	18
Resources	19
Signing Off	20

## Letter from the Editor

Welcome back to the Seating Series! I am happy to finally release the 2nd edition for you. I am definitely eating my words when it comes to how frequently I thought I'd be able to release this publication. Originally I thought bi-monthly newsletters would be manageable for me, but now I see that was way too optimistic of a goal. However I do want to continue to see this project develop, and the feedback I received from several readers indicated that this newsletter would be useful to them. So I am committed to ongoing publications but have to admit that their release will have to be more sporadic in the future. There were several suggestions for upcoming topics so I promise to cover each of those at some point in the future.

I wanted to take a quick minute to remind readers that this newsletter contains information based for the most part on my clinical experience and knowledge gained over the years. My legal department would like me to state that the views and opinions reflected in this publication do not represent the Health Sciences Centre as a whole and therefore they cannot be held legally responsible for its content.

Your feedback continues to be extremely valuable to me so I encourage you to continue to bring forward ideas, suggestions, comments, and any other information that you would like to share.

Hope you enjoy the second issue!

***Jen Birt, Editor and Founder of The Seating Series***

## Readers' Reviews

I was absolutely overwhelmed by all the positive feedback and comments I received after the first newsletter was sent out. I truly appreciate everyone who took the time to contact me—as I've mentioned before, I hope this newsletter will grow and evolve based on readers' response to it. Feedback is always welcome so keep it coming! I've included some of the feedback and questions in this section for you. Information has remained anonymous in case people preferred not to be identified.

*"I just finished reading your first issue of the Seating Series. I wanted to thank you for all your work and for sharing your expertise! I don't often deal with seating in this setting and because of this I feel a bit rusty when it does come up. I appreciate all the angles (ha ha) you explored in relation to this topic. It's nice to now have a comprehensive written resource to refer to when these issues arise. I definitely will continue to read your upcoming issues."*

*"I love it! Well written. Can't wait to learn more."*

*I am super impressed with all the work and content of the Newsletter. WAY TO GO! Good Job on getting some of those points on paper since I know seating is a very intuitive process for you."*

*"I just wanted to take a second to tell you how much we appreciate the seating series news letter. We found it very informative, well written, useful, applicable and overall just an amazing idea. We are very excited about future volumes and are going to brain storm some ideas that we would like to learn more about."*

*Just wanted to note that the newsletter you prepared is amazing. It is so professional looking, well presented, enticing to read and so much more. Congratulations to you and all those who helped. Well done!"*

*"Just wanted to say....awesome job!! The Seating Series First Edition looked great. Very clear and informative. I think it is admirable all that you do in your job and how much passion and knowledge you have. You are an inspiration!"*

*"I just want to thank you and congratulate you on your newsletter. It looks great and I am sure your efforts will be appreciated. Well done!"*

*"This is a FANTASTIC initiative"*

*"Excellent publication Jen, well written with good content and presented in a format that is easy to read."*

*"I just wanted to say thanks for that newsletter- what a great idea! It seems like it will be a super helpful resource,*

*and something I can come back to later for more info when the need arises. As someone who does seating sometimes, but not always, this looks like a great resource"*

*"Jen...I don't work in seating...but still wanted to pass on that if I did, this would be a fabulous resource! What a great job you are doing of reaching out to others, sharing your knowledge, and providing an accessible way for people to come together on a topic."*

*"What a fantastic newsletter! I really like the way you have set it up- there is something for everyone, whatever their level of expertise. I am actually going to start a binder for us here. The info in your newsletter will be such great reference material."*

### Questions:

**Q: "You mentioned an angle app for iPhone. I searched angle meter and a few came up - some free some not. Do you have a preference?"**

**A:** Regarding the angle meter apps, the one that we've used the most is called "iHandy level", it's a free iPhone app. Once downloaded, it will bring up a picture of a level that will also record the angle reading in the top left corner of the screen.

**Q: How does knee and ankle angle affect seat to back angle/posterior pelvic tilt?**

**A:** Great question! If range of motion at the knees and ankles is limited or influenced in anyway by musculoskeletal factors then knee angle can have a significant influence on pelvic positioning and seat to back angle. Typically the tighter someone's hamstrings are, the more likely they will cause the pelvis to rotate into posterior tilt as the knees are extended. The available movement a person has at their knees should translate to the foot hanger angle in the wheelchair, so it is important to avoid extending someone's knees beyond their available range when positioning them on footrests. Ankle range of motion doesn't directly influence seat to back angle/posterior pelvic tilt, but it does have an indirect impact. Limitations in ankle range of motion can effect how well someone's foot remains positioned on a footplate, which in turn can change their knee angle which will have a cascading effect on pelvic position. Also, spasticity is commonly triggered with certain ankle positions so if limitations in ankle range of motion cause spasms to be triggered this will have a significant impact on overall posture including pelvic positioning and seat to back angle.

## Spotlight On . . . Dynamic Tilt-in-Space

### What is dynamic tilt-in-space?

It is a feature that allows a wheelchair to change its seat base orientation relative to the ground while maintaining the seat to back and seat to legrest angles (see diagram below).

Through either a manual or power-operated mechanism, the seat base on dynamic tilt wheelchairs can be moved anywhere throughout the range of tilt that is available on that specific mobility base. Providing clients with the ability to operate a tilt mechanism independently will allow them to control not only the position they tilt to, but also how frequently they change their tilted position when seated.

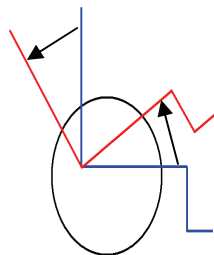
The majority of dynamic tilt wheelchairs operate in a posterior direction. That is, when engaging the tilt mechanism, the person will move in and out of a more rearward direction relative to upright as a starting position. There are, however, dynamic tilt wheelchairs that allow a user to be tilted laterally (angled towards the right or left from upright), and even some that can be configured to tilt in an anterior direction (the seat base moves more forward from upright).

It is important to know that not all wheelchairs are created equal with regards to dynamic tilt-in-space. There is large variability among design features for this specific type of mobility base including:

- The mechanism of tilt
- The overall tilt range
- Impact of tilt changes on chair configuration
- How tilt is operated

It is important to understand the functional implications that each product will have so the pros and cons of equipment options can be evaluated thoroughly prior to a final prescription.

Please refer to **“Not all Tilt Wheelchairs are Created Equal. Know Your Product!”** for more information.



### Why is this feature so important?

The following list summarizes some of the main clinical benefits and applications of this feature for individuals who rely primarily on wheeled mobility:

1. **Pressure management** → in general terms the literature has shown that the further back a person tilts the more they will redistribute pressure away from the bony areas of their pelvis (i.e. ischial tuberosities, coccyx, and sacrum).
2. **Postural management** → this is actually a very broad heading, and covers several concepts, but in general it refers to the importance of this feature for assisting with balance, stability, and gravity assisted postural alignment with clients who have compromised strength, mobility, and endurance
3. **Comfort and pain management** → this is probably the most important application this feature offers from a client-centered perspective. To understand it better, try to imagine yourself sitting in a chair for 8 hours straight with absolutely no ability to move yourself the entire time. How comfortable would you feel?
4. **Spasticity and shear management** → spasms are commonly triggered with movement which can have detrimental effects for clients because it often leads to shearing and loss of proper positioning. Dynamic tilt offers the benefit of movement while inhibiting spasms by maintaining static postures.
5. **Transfers, repositioning and self care** → transitioning into tilt offers caregivers a gravity-assisted position to stabilize clients in the wheelchair while allowing easier access to their body to perform these functional tasks.
6. **Physiological benefits** → the use of dynamic tilt can offer enhanced respiration, swallowing and digestion, visual orientation and alertness, as well as speech and oral output. It also offers the ability to manage orthostatic hypotension and edema to a certain degree, however better outcomes are typically achieved when combining dynamic tilt with recline for these purposes.
7. **Sitting tolerance and endurance** → dynamic tilt offers versatility with positioning so that clients can utilize upright postures for functional tasks combined with tilted postures for rest as a way to maximize endurance and sitting tolerance for those who fatigue quickly.

## A Worthy Excerpt: Tilt vs Recline

Even though the focus for this newsletter is dynamic tilt, I feel that it is worthwhile for me to differentiate it from another dynamic seat function called recline, primarily because the application of both these features plays a large role in pressure management and positioning.

Unlike tilt, **dynamic recline** is a feature that allows a wheelchair to change its seat to back angle over a dynamic range of movement within the seat base. Even though both of these features can have an impact on pressure distribution and posture, it is important to be aware that they do so very differently and therefore must be evaluated separately. Let's take a closer look at both of these features, and highlight some of the advantages and disadvantages for clinical applications:

	TILT	RECLINE
<b>Impact on pressure distribution</b>	<ul style="list-style-type: none"> <li>• Pressure redistribution increases with tilt range</li> <li>• Pressure at coccyx and sacrum may increase in lower tilt ranges but decreases in higher ranges</li> <li>• Minimal risk of shear</li> </ul>	<ul style="list-style-type: none"> <li>• Pressure redistribution increases with recline</li> <li>• Pressure and shear at coccyx and sacrum increases with more recline (ischials also subject to shearing)</li> <li>• High risk of shear (more damaging than pressure)</li> </ul>
<b>Impact on posture</b>	<ul style="list-style-type: none"> <li>• No change to static posture while tilting</li> <li>• Improved postural stability and balance with gravity assisted orientation</li> <li>• Minimal risk of triggering spasms</li> <li>• Risk of joint contractures at hips</li> <li>• Risk of posterior pelvic tilt and kyphosis without posterior pelvic positioning (PSIS support)</li> </ul>	<ul style="list-style-type: none"> <li>• Hips become more extended while reclining</li> <li>• High risk of postural instability and sliding with more recline because it is not a gravity assisted position</li> <li>• High risk of triggering spasms (influenced at hips)</li> <li>• Low risk of joint contractures at hips</li> <li>• Risk of posterior pelvic tilt without PSIS support</li> <li>• Risk of posterior pelvic tilt even with PSIS support as interface to this support changes with recline</li> </ul>
<b>Interface with seating components and positioning accessories</b>	<ul style="list-style-type: none"> <li>• Minimal impact with interface to seating components</li> <li>• All positioning accessories will stay consistent with individual's body regardless of orientation in space</li> </ul>	<ul style="list-style-type: none"> <li>• High risk for loss of proper interface with seating components if sliding occurs (anti-shear style recline will reduce the impact of this somewhat)</li> <li>• Orientation to trunk and upper body positioning accessories will change with recline</li> </ul>
<b>Orientation to drive mechanism and environment</b>	<ul style="list-style-type: none"> <li>• No impact on orientation to power operated drive mechanism</li> <li>• Negative impact on visual orientation with higher ranges of tilt</li> <li>• Cannot fit under tables or keep items on a laptray in higher ranges of tilt</li> <li>• Certain wheelchairs will have minimal impact on overall wheelchair footprint and centre of gravity when tilted (others will have large impact on this)</li> </ul>	<ul style="list-style-type: none"> <li>• Harder to reach drive mechanism with greater degrees of recline unless it is also dynamic</li> <li>• Negative impact on visual orientation with higher ranges of recline</li> <li>• Can still fit under tables and maintain items on a laptray in recline but harder to reach these items</li> <li>• Increases the overall length of the wheelchair footprint and changes centre of gravity (rearward tippy) when reclined</li> </ul>
<b>Impact on Function</b>	<ul style="list-style-type: none"> <li>• Risk of impeding bladder and bowel function</li> <li>• Independence with repositioning</li> <li>• Risk of being a restraint if caregiver operated</li> <li>• Tilted position helps with mechanical lift transfers</li> <li>• Tilted position may help with caregiver assisted dressing (lower body)</li> </ul>	<ul style="list-style-type: none"> <li>• May improve bladder draining and bowel function</li> <li>• Manual repositioning will still be required if sliding occurs</li> <li>• Risk of being a restraint if caregiver operated</li> <li>• Minimal benefit for mechanical lift transfers</li> <li>• Reclined position may help with caregiver assisted dressing (upper and lower body)</li> </ul>

# Hands On! Assessing for Dynamic Tilt in Space . . .

## BASIC

As previously described, there are several indications for the application of dynamic tilt-in-space. The focus of these next 3 sections and the remainder of this newsletter will be on the most common indication for use of this feature: **pressure management**

One of the largest risk factors for developing a pressure sore in sitting is **immobility**. For individuals with physical disabilities, there are a variety of factors that may affect their ability to move: decreased strength, abnormal muscle tone, change in cognition, or pain, to name a few.

Any individual who requires the use of a wheelchair must undergo a number of assessments to determine what the most appropriate type is. To specifically decide whether dynamic tilt-in-space is indicated, certain evaluations should occur that test how effectively an individual can move and reposition themselves for the purpose of managing pressure when sitting.

### **ASSESSMENT 1: determining a person's ability to sit upright against gravity**

When evaluating an individual in a seating context, it is important to first determine their ability to maintain an upright posture against the influence of gravity. An individual's strength, muscle tone, and postural alignment will all have an impact on sitting. Determine an individual's ability to sit on a solid surface (such as a plinthe) by using the following categories:

- **Dependent sitter** —> requires full assistance to sit; no active strength or balance to hold themselves upright against gravity and would completely lose posture if their trunk wasn't supported externally
- **Hands-dependent sitter** —> requires the use of upper extremities at all times to sit; can hold themselves upright against gravity without assistance but fatigues quickly; if asked to raise their upper extremities away from the sitting surface they would be unable to balance unless they had external support. These clients also tend to demonstrate a "collapsed" posture out of midline for a more stable base of support to compensate for lack of balance

- **Hands-free static sitter** —> independently capable of holding themselves upright against gravity without use of upper extremities; if asked to reach in any direction away from static position they cannot maintain balance without use of upper extremities or external support
- **Hands-free dynamic sitter** —> independently capable of holding themselves upright against gravity without use of upper extremities; if asked to reach in any direction away from static posture these individuals can maintain balance without the use of upper extremities. People may fluctuate between hands free static and dynamic depending on the direction they are asked to move and fatigue

In general, anyone who is a **dependent sitter** will require the use of dynamic tilt to manage pressure in sitting.

**Hands-dependent and hands-free static sitters** may also require this feature, but further evaluation as outlined in assessment 2 would be necessary before making a final decision.

**Hands-free dynamic sitters** should not require the use of dynamic tilt in sitting but screening their abilities with assessment 2 is still recommended.

### **ASSESSMENT 2: determining weight shifting ability (pressure redistribution movements) in supported sitting**

Best practice guidelines for pressure management in a sitting position recommend **ideally** that a *pressure redistribution movement* occurs every 15 minutes and be held for 1-2 minutes. In the best case scenario, this type of movement should aim to *fully off-load or minimize* the amount of pressure remaining over bony surfaces of the pelvis that weight bear in sitting (i.e. ischial tuberosities, coccyx, potentially sacrum and/or greater trochanters).

With your client sitting in a wheelchair, assess their ability to perform the following pressure redistribution movements and evaluate how effective these

(Continued on page 6)

# Hands On! Assessing for Dynamic Tilt in Space . . .

## BASIC

(Continued from page 5)

movements are by using your hands to palpate and confirm offloading to bony areas of the pelvis with each movement:

**Standard or partial push-up:** direct client to use their upper extremities to push down against the armrests (or rear wheels of manual wheelchairs) in order to try and lift their buttocks up away from their sitting surface. This movement should provide effective pressure redistribution away from all bony areas of the pelvis when performed correctly. This movement requires a significant amount of upper extremity strength and can cause stress on people's wrists when performed over extended periods of time. Even if individual's can only partially lift their body when performing this movement some pressure redistribution and improved blood flow will still occur. Palpation will help you to determine whether the movement performed is sufficient.

**Forward lean:** direct client to lean their trunk forward towards their thighs as far as they can go. As long as the individual can perform this movement without losing balance it should provide effective pressure redistribution away from the coccyx, sacrum and greater trochanters. The further forward someone is capable of leaning, the better their chances are of also providing effective redistribution away from the ischial tuberosities. Finding ways for someone to be able to relax once they have transitioned forward will help reduce the amount of energy expended to hold this movement. For example, leaning forward onto a bed, sofa, or table helps stabilize the trunk passively while performing this movement.

**Right and left side leaning:** direct client to pull and/or push against the armrests (or rear wheels of manual wheelchairs) to move their body over to one side. This will raise the opposite side of their buttocks up away from the sitting surface. Avoid having them lean directly sideways but rather at about a 45 degree angle so it's a combination side/forward leaning movement. This should provide effective pressure redistribution away from the ischial tuberosity and greater trochanter on the side that gets raised up, as well as redistribution away from the

coccyx and sacrum. It's important to remember that this movement also increases the amount of pressure remaining at the ischial tuberosity and greater trochanter that are still weightbearing against the sitting surface. Clients should therefore be evaluated for their ability to perform this movement in both directions and encouraged to alternate between each side when leaning for pressure management.

When evaluating all the movements listed above, it is important to ensure your client does not drag or shear their body against their back support while moving.

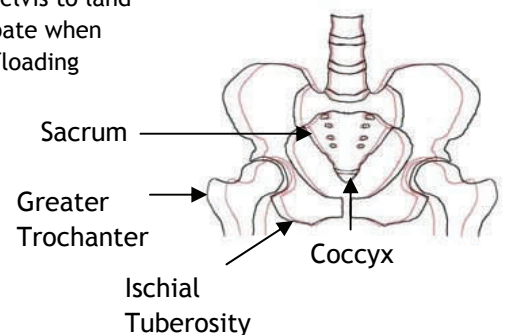
**Standing:** some may think that if a person is capable of standing then they shouldn't require the use of a dynamic tilt wheelchair but this is not always the case. There are a number of physical conditions that may prevent an individual from being able to perform the previously described pressure redistributing movements and still provide them with enough function in their lower extremities for standing to occur (e.g. incomplete SCI, MS)

In general, individuals who **cannot perform any** of these movements effectively will **definitely require** the use of dynamic tilt.

Those who can only perform **one of these movements** effectively will **likely still require** the use of dynamic tilt. Fatigue, endurance, and risk of repetitive strain make it difficult for those who can only perform one movement to maintain this ability over the course of the day and for longer periods of time.

Those who can perform **2 or more** of these movements effectively **should not require** the use of dynamic tilt.

Areas of the pelvis to landmark and palpate when confirming offloading



# Hands On! Assessing for Dynamic Tilt in Space . . .

## Intermediate

One of the most crucial steps in the process of wheelchair seating is the equipment trial phase. Regardless of how thorough someone has been evaluated, it is not recommended to make a final decision about the equipment they will require without first undergoing an equipment trial evaluation phase. Depending on the setting you are working in, use of dynamic tilt may be a temporary need or it may be a permanent one. Following some form of evaluation protocol is applicable in any circumstance even if this type of mobility base is only an interim solution. Understanding the seating goals and objectives before engaging in equipment trials is a necessary step to ensure your trial phase is outcome-oriented.

### **ASSESSMENT 3: Sitting Protocol and Skin Checks**

One of the practical guides that I follow when engaging an individual in a sitting protocol is determining first of all whether baseline is “good” or “bad”. With regards to evaluating a piece of equipment for pressure management purposes, this means determining whether baseline skin condition before using the piece of equipment is better or worse than I want it to be. Skin checks are an essential part of this evaluation.

Some of the generic indications that I follow to decide if **skin is “good”** include:

- no areas of redness or signs of trauma (e.g. bruises, blisters, scrapes) over bony prominences
- any redness that may be present is both blanching and not localized over a bony prominence.

Some of the generic indications that I follow to decide if **skin is “bad”** include:

- non-blanching redness or open areas correlating with bony prominences
- heat, swelling, or a “boggy” consistency over reddened areas
- signs of trauma (e.g. bruises, blisters, scrapes) referencing to bony areas that will weightbear in sitting.

Another practical guide that I follow when engaging an individual in a sitting protocol is to allow the adjustment to something new to be gradual over time. Introducing a new type of wheelchair for an individual to use can take time to adjust to, particularly

when it comes to skin tolerance. The following is a suggested sitting protocol guideline for the introduction of dynamic tilt (when starting skin condition is “good”):

**Step 1:** skin check (make sure to closely evaluate all bony areas of the pelvis and take note of any concerns) then transfer into wheelchair

**Step 2:** first sit time for **1 hour**; make sure you figure out the most effective way to get your client transferred into the right position and check to be sure that their posture is supported as needed based on outcome of seating assessment. The client should engage in **3 full tilts** during this hour ideally.

**Step 3:** transfer out and check skin. Inspect all the same areas as baseline for comparison.

**Step 4(a):** skin check is as good as baseline or better, then transfer back in and perform 2nd sit time (see step 5).

**Step 4(b):** skin check is worse than baseline; reassessment is required to resolve pressure issues then re-initiate sitting protocol from the start.

**Step 5:** second sit time for **2 hours**; client should engage in **7 full tilts** during this time ideally.

**Step 6:** transfer out and check skin. Inspect all the same areas as baseline for comparison.

**Step 7(a):** skin check is as good as step 4 or better, then transfer back in and perform 3rd sit time (see step 8).

**Step 7(b):** skin check is worse than step 4; return to step 2 and continue sitting protocol.

**Step 8:** third sit time for **4 hours**; client should engage in **15 full tilts** during this time ideally.

**Step 9:** transfer out and check skin. Inspect all the same areas as baseline for comparison

**Step 10(a):** skin check is as good as step 7 or better, then transfer back in and perform 4th sit time (see below)

**Step 10(b):** skin check is worse than step 7; return to step 5 and continue sitting protocol

Continue to **double each sit time** as long as skin is as good as (or better than) the previous sit time.

**Reduce sitting time by half** of what was previously completed any time there are issues with a skin check.

# Hands On! Assessing for Dynamic Tilt in Space . . .

## Advanced

Once you have determined that someone will require dynamic tilt-in-space, further evaluation will be required to determine how this feature will be operated and ensure that it is being used appropriately. It is also important to remember that a client's ability to function in a wheelchair is not always easy to slot into a category such as "needs tilt" or "does not need dynamic tilt". Having an awareness of clients' prognosis, risk of functional deterioration (or improvement) over time, patterns of sitting over the course of a day and week, as well as re-evaluation of their condition after a trial period with the wheelchair are all essential steps when evaluating seating outcomes.

### **ASSESSMENT 4: Functional operation of dynamic tilt mechanism**

When evaluating a person's functional performance with a wheeled mobility device it is important to consider all aspects of a wheelchair seating system as a whole. This involves incorporating the mobility base with the seating components and any relevant accessories to determine an individual's function with the proper set-up. A portion of this evaluation for individuals who require dynamic tilt-in-space involves assessing how the tilt feature will be operated. There are 2 main categories that describe how tilt can be operated: manual and power.

**Manual tilt -->** a manual-operated tilt mechanism requires an individual to physically engage a mechanism that is connected to a "brake" by a cable that allows the movement in and out of tilt to occur. As long as the release mechanism is activated the chair will move in and out of tilt. Once this mechanism is disengaged the chair will stop tilting. Further physical effort has to be exerted to a certain degree to push down on the wheelchair frame so that it will move into tilt. Opposing physical effort in a pulling direction will move someone out of tilt and back into an upright position. The impact that moving in and out of tilt has on the overall center of gravity will dictate how easy or difficult it is for someone to be moved in and out of tilt. The majority of manual tilt mechanisms are found on manual wheelchairs however, there are some power wheelchairs that offer

the option of manual dynamic tilt (e.g. Invacare TDX Spree). Also, the majority of manual tilt mechanisms are caregiver-operated and located at the rear of the wheelchair however, there are some products that offer the option of a manual self-tilting device that an individual could operate independently (e.g. PDG Stellar).

The 2 most common manual tilt mechanisms are:

1. **Hand release levers -->** usually located at the rear of the wheelchair where the push handles are, requires caregivers to squeeze on 1 or 2 levers to engage tilt mechanism. If the option is available on specific types of wheelchairs, single hand release levers can be mounted somewhere along the armrest to allow an individual to operate the tilt mechanism independently.
2. **Foot pedal -->** located at the rear of the wheelchair closer to the ground, somewhere around where the anti-tippers are usually found. While a foot release frees up a caregiver's hands for tilting, it can be harder to access when trying to move someone out of a tilted position.

Manual tilt is appropriate for:

- Individuals who are incapable of operating a tilt mechanism independently (see section below) or
- Can operate a tilt mechanism independently and have enough strength, movement, and cognitive capacity to use a manual device
- Need a lower cost alternative to a power tilt device if independent mobility is not a feasible option

**Power tilt -->** A power-operated tilt mechanism allows an individual to activate a switch or device that will engage an actuator that moves the wheelchair seat base into and out of a tilted position. The majority of power tilt mechanisms are included as an up-charge feature on power wheelchairs however, there are a small number of manual tilt-in-space wheelchairs that offer the option of a power-operated tilt device (e.g. Future Mobility Orion II with Power Tilt).





(Continued on page 9)

# Hands On! Assessing for Dynamic Tilt in Space . . .

## Advanced

(Continued from page 8)

To evaluate whether an individual is appropriate for power tilt the following checklist should be completed:

	<p><b>Screen upper extremity function first for available movement to activate a specific type of switch</b></p> <p>Most common switches are button (push-style), or toggle (lever-style) so an individual needs to have enough upper extremity function to engage either of these mechanisms. Off-the-shelf factory installed tilt switches are commonly located within or close to a joystick. The location of this switch can always be customized if an individual has better upper extremity function in a different location. Make sure to assess how and where someone can <b>most reliably</b> activate the mechanism to tilt to determine this.</p>
	<p><b>Screen cognition:</b> is the individual capable of understanding how, when and why to tilt? Can they reliably perform this task more than once after instructed and demonstrated how to do so? Do they perform this task safely, reliably and without cueing? Will they be able to perform this task consistently over an extended period of time? If someone is at risk for cognitive decline, be sure to consider a back up plan for how the wheelchair and tilt device will continue to be operated should someone lose independence with this task.</p>
	<p><b>Screen for alternative body locations to activate a switch if someone does not have the upper extremity function to engage the power tilt device</b></p> <p>Some alternative sites include: head, mouth, or foot</p> <p>Individuals who may require a more customized method of operating their power wheelchair and tilt mechanism can be referred to the Occupational Therapist in Assistive Technology Products and Services at HSC for consultation (please call 787-8530 if you have any questions about this service)</p>
	<p><b>Assess for reliable activation of power tilt device in a variety of tilted positions.</b></p> <p>As a person's body orientation against gravity changes the function they have to activate a tilt switch may also change. For example, it is common for individuals with decreased strength and mobility in their upper extremities to have a harder time returning to an upright position once they are in tilt because they have to fight harder against gravity to activate the tilt switch.</p> <p>Explore the option of secondary positioning supports to ensure someone will be able to maintain access to their tilt switch at all times regardless of their orientation in space.</p>

**Education is Key!** Regardless of whether tilt is activated manually or through a powered device, its purpose should be thoroughly explained to clients and caregivers so they understand the importance of utilizing this feature. With regards to the application of dynamic tilt for pressure management, the **most comprehensive** recommendation offered in best practice literature states that individuals should perform a "full" tilt every 15 minutes (4 times/hour) and hold this position for 1-2 minutes. Clients need to be aware of this recommendation and understand why it is suggested. The primary purpose of the tilting movement is to redistribute pressure away from the buttocks and increase blood flow and circulation to this area. Demonstration of what a "full" tilt means (i.e. tilting back as far as the mechanism on the mobility base allows—ideally 45 degrees or more) should be included with this education so clients can get a sense of how far back they actually have to go and what it feels like to be in this position. Problem solving functional ways to incorporate regular tilts into a typical day is also an important way to ensure follow through with these recommendations. Please refer to "**Seating Solutions**" for further information.

---

# Hands On! Assessing for Dynamic Tilt in Space . . .

## Advanced

### **ASSESSMENT 5: Pressure Mapping**

Interface Pressure Mapping (IPM) is an evaluation tool that allows objective measurement of interface pressure between a person's body and the support surface they are sitting (or lying) on. It is also a powerful education tool for clients and caregivers. Despite the fact that there is no magic "cut-off" value or number that dictates when pressure ulcers will develop, clinicians can still evaluate patterns of pressure distribution and make interpretations based on the quality of distribution, particularly around the bony prominences of the pelvis. Pressure mapping should never replace the other evaluations clinicians perform to assess skin tolerance (i.e. skin checks and palpation), however it can be an effective supplementary evaluation in this process. The topic of IPM is too large to delve into for this particular newsletter, but I recommend referring to Vista Medical's website directly because it has links to useful resources and information regarding how to use this technology ([www.pressuremapping.com](http://www.pressuremapping.com)).

When utilizing IPM to evaluate the effectiveness of dynamic tilt-in-space, I will generally follow this guideline as my clinical application:

1. **Baseline reading**—typically taken when the individual is sitting "upright", or as upright as they generally sit on a regular basis. While waiting to capture this reading, I will utilize the time to orient the individual and/or caregivers to the screen and discuss what they are seeing with regards to pressure distribution and posture.
2. **Tilted to client's preferred functional position**—most clients who use dynamic tilt will typically position themselves in 10-20 degrees of tilt just to be in a more supported position to function during the day. This application of tilt can typically be categorized as "gravity-assisted postural support". While waiting to capture this reading, I will utilize the time to compare this reading to baseline. Generally this range of tilt won't offer any significant pressure redistribution, and therefore should not be viewed as a pressure management type of tilt. One thing to be careful of for clients who prefer sitting in this position is ensuring this position does not localize too much pressure at the coccyx/sacrum.

3. **Tilt past 30 degrees**—the majority of the literature has shown that tilting beyond 30 degrees is necessary to demonstrate a *significant* difference in pressure distribution at the seated surface. While waiting to capture this reading, I will utilize the time to compare this reading to baseline paying particular attention to the amount of change in pressure distribution around specific bony prominences. How do you know if past 30 degrees is enough? By combining the objective values seen during pressure mapping with your skin checks, palpation, and sitting protocol, you will be able to formulate a comprehensive evaluation of how effective this amount of tilt is.
4. **Full tilt**—most studies have also shown an *exponential improvement* in pressure redistribution the further beyond 30 degrees that someone tilts. That means that the highest ranges of tilt will have the *most significant improvement* and impact on pressure redistribution. Much of the literature has tested tilt beyond 45 degrees to demonstrate this result. While waiting to capture this reading, I will again utilize the time to compare this reading to other positions paying particular attention to the change in pressure distribution around specific bony prominences. Given that several dynamic tilt wheelchairs only provide a tilt range up to 45 degrees maximum, I will always attempt to have a mobility base available that tilts beyond this range (i.e. 55-60 degrees). This provides me with comparison values of the highest range of tilt to evaluate those individuals who are at high risk of developing pressure ulcers or have already shown signs of skin breakdown.

### **SPECIAL CONSIDERATION: Ventilators**

Just a quick note on clients who use ventilators when sitting in their wheelchairs: depending on the specific type of ventilator and particular positioning requirements of that equipment, it may interfere with the overall tilt range on dynamic tilt wheelchairs. If tilt is being prescribed for pressure management this issue must be avoided. Any prescription of a dynamic tilt wheelchair for individuals who require the use of a ventilators should involve Respiratory Therapy and Assistive Technology Products and Services to ensure a collaborative solution is reached when interfacing the equipment together.

# Not all Tilt Wheelchairs are Created Equal

## Know Your Product!

There is a large variety of dynamic tilt wheelchairs available on the market and these products continue to evolve and expand to meet the demands of wheelchair users. Sometimes it can be overwhelming to keep on top of all the different types of wheelchairs, as well as the pros and cons of wheelchair features, so having a handle on some specific dynamic tilt parameters and design principles can help to narrow the choices down. Your clinical trial and evaluation phase with the actual equipment will then allow you to finalize your equipment prescription. Here are the main parameters to consider when selecting a manual dynamic tilt wheelchair:



### **Feature 1: Mechanism of Tilt**

This establishes how the seat will move on its base to allow the movement into tilt. These are the most common tilt mechanisms:

- (a) **Rearward pivot** —> to go from upright to a tilted position the user moves rearward (back drops down and seat raises up) in an arc over a static pivot point at the rear of the wheelchair frame. The seat base ends up being more posterior relative to the frame when tilted which increases the overall length and changes the centre of gravity. This may cause the chair to feel “tippy” and increases the effort required to bring someone back up out of a tilted position.
- (b) **Forward pivot** —> to go from upright to a tilted position the user moves down (rear of seat drops while front remains stationary) over a static pivot point at the front of the seat base. This style of tilt usually accommodates smaller ranges of tilt only (up to 20 degrees).
- (c) **Rotational pivot** —> to go from upright to a tilted position the user moves along a semi-circular shaped arc so that the centre of gravity remains stable as the individual transitions throughout this movement. The seat ends up remaining within the frame when tilted so stability and balance is not compromised in this position. Overall wheelchair length does not change significantly in a tilted position and the effort required to move someone in and out of tilt remains the same regardless of their orientation in space.

### **Feature 2: Range of Tilt**

Refers to the start and end point for movement into tilted positions and is measured in degrees. Confirmation of actual tilt range when applied clinically is recommended (with an angle measurement tool) rather than relying on the tilt range that is advertised by the manufacturer. Certain configurations may limit the “ideal” range to accommodate specific features so it’s a good idea to double check.

I would categorize tilt range in the following way:

- (a) **Low Range**—wheelchairs that offer dynamic tilt up to 20 degrees. They generally use a forward pivot design which allows the full range of tilt to occur without any change to the user’s knee height. More ideal for postural applications with users who can foot propel independently.
- (b) **Mid Range**—wheelchairs that offer dynamic tilt up to 45 degrees. Majority tend to use a rearward pivot design. Can be applicable for a wide variety of uses, but would require a tilt range >30 degrees to even be considered for pressure management purposes.
- (c) **High Range**—wheelchairs that offer dynamic tilt greater than 45 degrees. Majority will be a rotational pivot design in order to maintain centre of gravity at high ranges of tilt. Can be applicable for all tilt uses but is most appropriate for individuals at high risk of skin breakdown.

### **Feature 3: Operation of Tilt**

Please refer to “**Hands On! Assessing for Dynamic Tilt . . . Advanced**” for details regarding manual dynamic tilt operation choices.

### **Other Features to Consider:**

The application of dynamic tilt tends to be required with more complex seating, therefore the remaining wheelchair features are also important to consider in addition to tilt features to ensure a fully integrated seating system. Specific items to consider include:

- **Seat base adjustability**—front and rear seat to floor height, width, depth, back cane height and angle, horizontal and vertical centre of gravity
- **Wide variety of component options**—rear and caster wheels, foot hangers and foot plates, armrests, headrests, laptrays
- **Additional features**—dynamic spring mechanism, contracture footrest system, vent tray

## The Load Down on Pressure: Redistribution with Changes in Tilt Angle

The development of pressure sores in sitting can result from a multitude of factors including pressure, shear, friction, heat and moisture as well as poor nutrition. There is no black and white recipe for determining which specific factor or combination of factors will cause skin breakdown in one person compared to another. As a result, it is important to evaluate each person on an individual basis.

The application of dynamic tilt is one tool that can be implemented to address pressure management by changing the duration and magnitude of pressure that is experienced at weight bearing surfaces while an individual is sitting.

As is the case with all seating equipment, the degree to which a dynamic tilt wheelchair can be effective depends on how appropriately it is implemented and used.

Here are some best practice guidelines regarding pressure management in sitting:

### **European Pressure Ulcer Advisory Panel (EPUAP) & National Pressure Ulcer Advisory Panel (NPUAP):**

*“Repositioning should be undertaken to reduce the duration and magnitude of pressure over vulnerable areas of the body” (Prevention)*

*“Repositioning frequency will be determined by the individual’s tissue tolerance, his/her level of activity and mobility, his/her general medical condition, the overall treatment objectives, and assessments of the individual’s skin condition.” (Prevention)*

*“Establish pressure relief schedules that prescribe the frequency and duration of weight shifts” (Treatment)*

### **Paralyzed Veterans of America (PVA):**

*“Avoid prolonged positional immobilization whenever possible” (Prevention)*

*“A weight shift every 15 to 30 minutes is recommended to allow the skin to be replenished with oxygen” (Prevention)*

*“Prescribe a power weight-shifting wheelchair system for individuals who are unable to independently perform an effective weight shift” (Treatment)*

*“Allow limited sitting in individuals capable of performing weight shifts every 15 minutes” (Treatment)*

*“Reposition the wheelchair-seated individual at least*

*every hour; if this is not possible and the individual is unable to perform weight shifts, return the individual to bed” (PVA—Treatment) \*Note:* This is also recommended by the Registered Nurses’ Association of Ontario (RNAO)

### **Spinal Cord Injury Rehabilitation Evidence (SCIRE):**

*“There is level 3 evidence that 1-2 minutes of pressure relief must be sustained to raise tissue oxygen to unloaded levels”*

*“There is level 4 evidence to support position changes to reduce pressure at the ischial tuberosities”*

*“65 degrees of tilt or forward leaning >45 degrees both showed significant reduction in pressure”*

*“The type and duration of pressure relief by position changing must be individualized post SCI using pressure mapping or similar techniques”*

So in general, when it comes to pressure management, the most important parameters to consider when making recommendations are:

1. **tilt frequency** → as previously stated, the most ideal scenario is every 15 minutes. Based on best practice guidelines, the worst case scenario would be once per hour for those who cannot reposition themselves. Whenever possible I make recommendations for the best case scenario and have to admit that I don’t actually agree with the worst case scenario. Why would I recommend for individuals who have no ability to move themselves to be repositioned **less** than those who can weight shift independently? By nature, these individuals are actually at a much higher risk than those who can move independently so they should be moved just as much if not more often in my opinion.
2. **Tilt duration** → the goal of repositioning for pressure management is not only to redistribute weighted load, but also to allow the tissue under this load to replenish by allowing circulation and oxygen to reach those tissues. According to the literature, for this to occur effectively the pressure redistribution movement has to be maintained for at least 1-2 minutes.

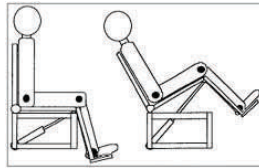
*(Continued on page 13)*

# The Load Down on Pressure: Distribution with Changes in Tilt Angle

(Continued from page 12)

3. **Tilt range** —> there is no magic number but there is a definite consensus that more is better. Practically this makes sense. The most effective way to redistribute pressure from a particular area is by completely offloading that area for a period of time. Since this is not possible for the majority of individuals sitting in dynamic tilt wheelchairs, the next best scenario is to minimize the amount of pressure as much as possible. The only way to take as much pressure away from the buttocks as possible is to tilt as far back as possible in the wheelchair.

Let's take a closer look at some of the pros and cons at different tilt ranges specifically with regards to pressure management, posture and function:



## 0—20 Degrees:

### **Pros:**

- Provides increased postural stability and balance against the influence of gravity
- Helps maintain postural alignment over time by counter-balancing the influence of gravity
- May help improve sitting tolerance by reducing postural fatigue
- May help improve blood flow and circulation at weight bearing surface
- May help improve visual field and head and neck orientation

### **Cons:**

- Will not have a significant impact on pressure redistribution and may actually increase the amount of pressure concentrated at the coccyx and sacrum
- Without proper positioning supports, may cause increased tendency into posterior pelvic tilt and trunk kyphosis
- May be harder to fit under tables if knee height is raised (depends on type of tilt wheelchair used)

## 20-30 Degrees:

### **Pros:**

- Should now start to have a more significant impact on pressure redistribution away from ischial

tuberosities specifically

- Gravity assisted positioning can help improve respiratory and digestive function

### **Cons:**

- Coccyx and sacrum may still be subject to increased concentration of pressure
- Accessibility may be a challenge with changes in knee height, head position, and overall length of wheelchair footprint
- Most power wheelchairs cannot be driven in this amount of tilt

## 30-45 Degrees:

### **Pros:**

- Exponentially greater pressure redistribution away from ischial tuberosities with less risk of increased load at coccyx and sacrum
- Can make caregiver assisted transfers and self care tasks that require lower extremity clothing to be manipulated more efficient

### **Cons:**

- May become harder to access power operated tilt mechanisms due to the influence of gravity on upper extremity function in this orientation
- Visual field becomes more negatively affected as sight line is now oriented upward
- Difficult to maintain foot and upper extremity positioning without proper secondary supports

## 45+ Degrees:

### **Pros:**

- This range of tilt will produce the largest and most significant pressure redistribution away from the pelvis as well as improved blood flow
- Uses the assistance of gravity to its maximum potential for caregivers to more effectively reposition individuals to the correct spot in their seating equipment

### **Cons:**

- May cause increased pressure ulcer risk at bony areas of the trunk (e.g. spinous processes or scapulae)
- Depending on the type of tilt wheelchair, centre of gravity may be rearward tippy and difficult for caregivers to transition an individual out of tilt

## Seating Myth Busters

### AUGUST'S MYTH:

***If an individual requires the use of dynamic tilt-in-space, they will ALWAYS require this feature.***



Absolutely not! While there *are* a wide variety of situations where the prescription of dynamic tilt will be a permanent need for someone, there are also several circumstances where dynamic tilt will only be necessary for a short period of time.

The process of reassessing individuals to determine when tilt-in-space can be discontinued is probably just as important as the initial assessments that occur to determine whether tilt-in-space is needed in the first place.

The most common scenario where dynamic tilt is only necessary as a temporary solution is with people who are an acute phase of a physical condition.

There may be some exceptions, but most of these clients typically fall within one of two categories:

- (1) Individuals who already have an existing physical or cognitive diagnosis and for whatever reason experience an acute deterioration as a result of that diagnosis or secondary conditions, or
- (2) Individuals who have recently been physically injured and their medical status is in an acute phase and likely not stabilized

The bottom line with both these scenarios is that there will likely be a period of time where the individual's mobility, strength, and potentially cognitive status prevent them from being able to manage pressure in a sitting position through any means

other than dynamic tilt.

Most often, however, as these individuals stabilize from a medical perspective, they will also regain strength, mobility, and function. It is during this period of change that they should be re-evaluated on a regular basis to determine whether dynamic tilt is still necessary.

Some common diagnoses where dynamic tilt-in-space is usually necessary early on but can be discontinued as individuals improve include:

- Complete spinal cord injury (SCI) levels C6 and below
- Incomplete SCI (ASIA C and D) at any spinal cord level
- Head injury
- Severe stroke
- Guillain Barre Syndrome
- Multiple traumatic fractures
- High level, bilateral, lower extremity amputations

Remember, it is important to evaluate each person on an *individual basis*, regardless of their diagnosis and presentation.

To determine whether dynamic tilt for pressure management purposes can be discontinued, individuals would need to meet all the following criteria:

- Be able to balance themselves upright against gravity without using their upper extremities to support themselves
- Perform more than one pressure redistributing movement reliably and effectively
- Demonstrate adequate skin tolerance when sitting for >2 hours

Once an alternative mobility base is introduced as a replacement, a new sitting protocol complete with skin checks will need to occur to ensure no new pressure issues arise.

## Seating Solutions

Okay, I won't lie, I have encountered a number of challenges when trying to implement tilt schedules in different settings. I agree that on the one hand this recommendation seems like something that would be too difficult to implement or maintain. However, I *promise* that it is definitely manageable and actually not much of a hassle at all as long as it becomes an ingrained habit for individuals.

That's where the importance of education comes in. I have come across a number of scenarios where clients may already have tilt wheelchairs but do not use this feature regularly, or to its full range. There can be several reasons for this, but some of the most common trends are:

- Client feels too nervous to be in a fully tilted position—fear of falling
- If they tilt too far back they can no longer reach the tilt switch to get back up out of this position
- They were never told or shown how to position themselves with tilt
- Being in a tilted position isn't socially acceptable
- They rely on caregivers to tilt them but don't have someone with them at all times to move them in and out of tilt
- Staffing resources in long-term care settings could never meet the demands of a tilt schedule every 15 minutes for multiple residents

Given that I recognize some of these challenges, I would now like to talk about some solutions and ways to make integrating dynamic tilt practical.

### **Solution 1: Independence where ever possible**

Providing someone with independence and autonomy to tilt themselves (over relying on someone else to do it) will not only improve their quality of life but it will also help provide them with the accountability to integrate this task into their daily lives. As previously mentioned, even those individuals who will not be able to use a power wheelchair may still be able to tilt independently if they have access to the right equipment.

### **Solution 2: Education is not just explanation**

- **Talk**—make sure to explain to clients and caregivers what the tilt feature is, what it does, and why it is important; highlight your recommenda-

tions for frequency and duration of tilt

- **Write**—make sure they key points you say are also written down so clients have something tangible to take away with them; pictures or even videos may be more powerful tools for situations where clients rely on others to tilt them
- **Show**—make sure your client gets a feeling for how far back they need to tilt by experiencing it; you may need to repeat this more than once; having individuals tilt in front of a mirror can be another useful way of helping them to understand what to do and reduce the fear of being in this position
- **Get buy-in**—have caregivers perform a full tilt with your client and time 1-2 minutes before they take the client out of this position. This will show them the realistic burden for performing this task

### **Solution 3: Schedule it, make it habitual, keep people accountable**

For a new task to become habitual there has to be motivation to do it and it has to be repeated consistently over a period of time before it becomes a learned behaviour.

Some practical ways to incorporate tilt into the day include:

- Alarms
- During each commercial break while watching television
- Incorporated into computer tasks—after X pages are written, after X games are played, after X songs are listened to
- Smart programming (some power wheelchairs only)—automatically programmed tilt at regular intervals
- Caregivers to multi-task tilt with other regular tasks in group settings. Several examples include: while bed is being made, while medications are being administered (tilt client first, then draw up medications, then take them out of tilt to administer), while prepping to bathe or feed someone, before or after being loaded into a transportation vehicle, in between games, songs, or recreational tasks while everyone else takes a “stretch” break
- Checklists that are displayed and have to be initiated after each tilt



## Ask the Expert

### What type of dynamic tilt wheelchair do you prefer and why?

This question is difficult to answer because it depends on several factors such as the clinical rationale for tilt, the functional needs of the client, level of independence for using the tilt feature, and how complex the positioning requirements are when interfacing all the equipment together. Every single tilt wheelchair on the market has pros and cons, and specifications that may be necessary to select for certain reasons can lead to trade-offs in other areas. The clearer you are with prioritizing the features that are necessary, the easier it will be to rule certain products in or out.

Regarding manual tilt-in-space wheelchairs, here are some general parameters that I will always consider when selecting a product:

1. **tilt range**—the bottom line when it comes to pressure management is that more is better so I will only consider the use of wheelchairs that allow 45 degrees or more of tilt for high risk clients
2. **Adjustability for positioning**—the more complex an individual's posture is, the more versatile the chair needs to be for adjustability to accommodate positioning; I look for wheelchairs that have adjustable angle back canes, seat width and depth adjustability, center of gravity adjustability, multiple foot hanger options, and the ability to change front and rear seat to floor height (ideally greater than 2") independent of each other
3. **Center of gravity mechanism of tilt**—necessary to ensure caregivers can manage moving an individual in and out of tilt without risk of injury and keeping the wheelchair base balanced during tilt movements
4. **Rehab seat base**—versatile base so that any commercial or custom seating component can be installed and interfaced with the wheelchair

A few examples of tilt wheelchairs that generally meet these criteria include: Quickie Iris, Invacare Solara 3G, and PDG Mobility Fuze T50

### When would you use recline instead of tilt?

I have to be honest and say that I have *rarely* prescribed dynamic recline and I have *never* used it without also using dynamic tilt. For me, it comes down to weighing out the pros and cons of each fea-

ture and there are just too many risks from a pressure management perspective when using dynamic recline *alone* in my opinion.

I will attempt to explain by sharing my approach to setting goals with complex seating. I always try to approach seating goals through the use of a prioritized hierarchy:

1. **Level 1** → the highest priorities are the essential factors required for someone *just to sit*:
  - Skin integrity
  - Balance
  - Tolerance for maintaining an upright position
  - Physiological functions in a sitting position such as breathing, swallowing, blood pressure
2. **Level 2** → the next priorities are the factors that will influence how consistently someone can sit *over time*:
  - Comfort
  - Pain management
  - Repositioning
  - Endurance (preventing fatigue)
3. **Level 3** → the last priorities are the factors that will *enable function* to occur when sitting:
  - Mobility (propelling or driving)
  - Fine motor tasks (eating, using computer)
  - Gross motor tasks (reaching, transfers)

In no way am I trying to suggest that the factors in levels 2 and 3 are of less value than the factors in level 1. Instead, what I'm trying to demonstrate is the fact that if you cannot succeed at level 1 then the next 2 levels will never be achievable anyway. So essentially, level 1 can be viewed as the "deal breaker" factors.

When I apply this hierarchy of goals to the potential use of dynamic recline *alone*, the deal breakers are always skin and posture. Recline puts an individual at high risk for skin breakdown due to shear, and high risk for lack of postural stability due to changes in hip angle and center of gravity.

It is for these reasons that I would never use recline *alone* but instead only consider it in combination with tilt.



## Online and At Your Fingertips

There are a significant number of resources available online regarding dynamic tilt-in-space wheelchairs. Unlike several other seating topics, this topic has actually received a lot of attention. The variety of resources that you will find include published articles, research outcomes, practical resource tools, presentations, and fact sheets specifically related to dynamic tilt.

I have decided to highlight a website that I have visited frequently which includes several of the types of resources outlined above. I have also attended a number of seating conferences where one of this facility's primary researchers, Stephen Sprigle, has spoken. He has a fantastic way of presenting very complex scientific material in a way that is memorable and easy to understand. The website is for the Rehabilitation Engineering Research Center on Wheeled Mobility (Mobility RERC). This facility is located at the Center for Assistive Technology and Environmental Access at the Georgia Institute of Technology in Atlanta.

Website:

[www.mobilityrerc.gatech.edu/index.php](http://www.mobilityrerc.gatech.edu/index.php)

Located on the main page is a link to "references and downloads". Click on this and it will pull up the following 6 options:

1. **Publications** → these are categorized by year with links to most of the specific documents that have been published. One of the dynamic tilt resources in this section is located under the category for 2009: *"Use of power tilt systems in everyday life"*
2. **Conference posters and presentations** → this section is also categorized by year and the location of where the presentation was delivered is also included. One of the dynamic tilt resources in this section is located under the category for 2010: *"Blood Flow and Pressure Changes that Occur with Tilt-in-Space"*. Presented at the RESNA Annual Meeting. Las Vegas, NV.
3. **Theses, dissertations and final products** → detailed, extensive full-text versions of a variety of theses and dissertations. One of the dynamic tilt resources in this section is: *"Biomechanical responses to seated full body tilt and their relationship to clinical application"*
4. **Product Development Fact Sheets** → information on several custom products that this department has developed. Currently there is no information in this section relevant to dynamic tilt-in-space.
5. **Project deliverables** → includes specific outcome-oriented resources related to project initiatives from this department. One of the dynamic tilt resources in this section is: *"Clinical recommendations for power tilt wheelchair systems"*
6. **Creating Rehabilitation Engineering and Assistive Technology Experiences (cRE/ATe) Student Projects** → includes a summary of information about projects that students have developed. Currently there is no information in this section relevant to dynamic tilt-in-space.



## Different Settings, Different Strategies: Implementing Tilt Across the Continuum of Care

As you've probably gathered by this stage in the newsletter, the application of dynamic tilt is quite an involved process. On top of all the considerations for assessing, trialing, and implementing this type of wheelchair we also have to work within the realities of different health care settings. A few of the major factors that have to be considered when implementing tilt across the continuum of care include:

1. **Access to appropriate equipment**—if dynamic tilt is required it should not be ordered for an individual until it is assessed and trialed. My motto is always “try before you buy!”. Two options for trialing equipment include: hospital or facility pool of equipment (if available) or vendor equipment (if appropriate—not for those whose qualify for SMD Wheelchair Services).
2. **Appropriate time and resources**—implementing a thorough trial of equipment involves skin checks and sitting protocols and on-going evaluation. There has to be a reliable and consistent plan in place to follow through with this for success in any setting.
3. **Consideration of funding**—how someone accesses equipment for trial, rental, and purchase will vary depending on funding. E.g. individuals who qualify for the Manitoba Wheelchair Program currently only have eligibility for one type of manual tilt wheelchair (Mapleleaf Supertilt) and the current structure of SMD wheelchair services does not offer the ability to access this wheelchair for extended trial.

Regardless of where an individual may be at any given time across the continuum of care, the steps necessary to implement a dynamic tilt wheelchair remain the same:

**Step 1:** initial assessments occur (those included in the “*Hands On Basic*” section as well as a thorough seating assessment)

**Step 2:** tilt trial is implemented (either for temporary or permanent need) and sitting protocol followed

**Step 3:** tilt is either **discontinued** because the individual functionally improves OR tilt **remains necessary** because the individual has plateaued

**Step 4:** decision has been made that tilt is necessary either for permanent or longer term interim use (beyond assessment phase). This step is about trialing alternative equipment options to finalize pre-

scription or setting up a rental tilt wheelchair for an interim period of time

**Step 5:** all necessary trial and evaluation steps have been completed for all seating and wheelchair equipment and final order is placed

**Step 6:** delivery and fitting protocol

The most important thing to remember is to make sure steps 1-4 occur **before** step 5 is carried out. This may require hand-over to different therapists as someone transitions throughout the continuum of care.

Here are a few things to consider throughout this process in different healthcare settings:

### Acute care:

- Tilt may be a temporary need and focus is more around establishing skin and sitting tolerance
- Functional condition may change rapidly so re-evaluation of tilt will need to occur often
- Commonly transferred from this setting before all dynamic tilt evaluation steps can be completed
- Need to consider interim solutions such as rental wheelchairs and handover to receiving therapists

### Rehab:

- Common for large functional changes and plateau to occur in this setting therefore could progress someone through all 6 evaluation steps
- Some rehab services are outpatient-based therefore a temporary or interim tilt wheelchair may be necessary before their own equipment is delivered and fitted

### Community:

- Covers a very broad spectrum of tilt wheelchair users—may be follow-up handover for new users or re-evaluation of long standing users
- Exchanging, upgrading, or downgrading of equipment is a common need in this setting
- Strategies for long-term success and use of dynamic tilt should be determined in this setting

### Chronic Care and Personal Care Homes:

- More commonly addressing the later stages of evaluation and tilt implementation
- Communication to these facilities from other settings prior to transfer is important if interim equipment is needed to determine what is available
- Ensure buy in and feasibility of tilt positioning schedules from staff and caregivers who will be managing individuals who use these wheelchairs

## Resources

Here's a list of resources that I utilized to put the content of this newsletter together:

1. Centre for Assistive Technology and Environmental Access (CATEA). **Draft of Clinical Recommendations for Use of Power Tilt Systems**. 2011. Can be accessed through the Rehabilitation Engineering Research Center on Wheeled Mobility (Mobility RERC) (refer to "**Online and at your Fingertips**" for website details).
2. Sharon Eve Sonenblum, PhD, and Stephen H. Sprigle, PhD, PT. **Blood Flow and Pressure Changes that Occur with Tilt-in-Space**. 2010. Can be accessed through Mobility RERC (see above).
3. Linda Norton, OT Reg (ONT), Patricia Coutts, RN, R. Gary Sibbald, BSc, MD, FRCPC (Med), FRCPC (Derm), MACP, DABD, and Nancy Curtin-Telegdi, MA. **Manual tilt wheelchairs: Device or restraint?** Can be accessed in the Spring 2010 Rehab & Community Care magazine (refer to [www.rehabmagazine.ca](http://www.rehabmagazine.ca) for access).
4. Laurie Watanabe. **Time to Tilt!** 2010. Can be accessed online in the February 2010 issue of Mobility Management magazine (refer to [www.mobilitymgmt.com](http://www.mobilitymgmt.com) for access).
5. Ed Giesbrecht, MSc, OT(C), and Danna Kendzierski, MOT. **Tilting the balance: Considerations for selecting tilt-in-space**. Can be accessed in the winter 2009 Rehab & Community Care magazine.
6. Brad Dicianno, MD, Jenny M. Lieberman, MS, OTR/L, ATP, Mark Schmeler, PhD, OTR/L ATP, and Lauren Rosen, MPT, ATP. **Scientific Summary of the Current Mobility-related RESNA Position Papers**. International Seating Symposium (ISS) March 2009. Can be accessed through the ISS website (refer to [www.iss.pitt.edu](http://www.iss.pitt.edu) for access).
7. European Pressure Ulcer Advisory Panel (EPUAP) and National Pressure Ulcer Advisory Panel (NPUAP). **Prevention and Treatment of Pressure Ulcers: Quick Reference Guide**. 2009. Can be accessed through NPUAP's website (refer to [www.npuap.org](http://www.npuap.org) for access).
8. Sharon Eve Sonenblum, ScM. **Understanding Wheelchair Use Patterns: Tilt-in-space**. March 2008. Can be accessed through Mobility RERC (see above).
9. Lange, M.L. **Tilt in space versus Recline—New Trends in an Old Debate**. June 2000. Published in Technology Special Interest Section quarterly. Can be accessed through the Department of Rehabilitation Science and Technology, University of Pittsburgh (refer to [www.wheelchairnet.org](http://www.wheelchairnet.org) for access).
10. Paralyzed Veterans of America (PVA). **Pressure Ulcer Prevention and Treatment Following a Spinal Cord Injury: a Clinical Practice Guideline for Healthcare Professionals**. August 2000. Can be accessed through PVA's website (refer to [www.pva.org](http://www.pva.org) for access).
11. Cheryl D. Fields. **Getting Centered with Tilt-in-space**. 1991. A publication from TeamRehab Report that can be accessed through the Department of Rehabilitation Science and Technology (see above).
12. MaryAnn Regan, RN BScN, Robert W. Teasell, MD, David Keast, MD, Jo-Anne L. Aubut, BA, Brianne Foulon, HBA, and Swati Mehta, HBSc. **Pressure Ulcers Following Spinal Cord Injury**. 2009. A publication from the Spinal Cord Injury Rehabilitation Evidence (SCIRE) initiative (refer to [www.scireproject.com](http://www.scireproject.com) for access).
13. **Invacare website:** [www.invacare.ca](http://www.invacare.ca)
14. **Sunrise Medical website:** [www.sunrisemedical.ca](http://www.sunrisemedical.ca)
15. **PDG website:** [www.pdgmobility.com](http://www.pdgmobility.com)
16. **Future Mobility website:** [www.future-mobility.com](http://www.future-mobility.com)
17. **Maple Leaf website:** [www.mapleleafwheelchair.com](http://www.mapleleafwheelchair.com)



## Signing Off

So concludes another issue of The Seating Series! I hope the information provided here is of some use to clinicians and offers some practical information that can be applied in a variety of clinical settings.

### Special Thanks

I wanted to take a quick minute to thank a couple of people who were important contributors to this issue of The Seating Series.

First, thanks to Elisha Watanabe, for your patience, willingness to listen and encouragement during the countless hours I spent trying to put this newsletter together. I appreciate your feedback and input as I formulated several ideas onto paper. Second, thanks to Neil MacHutchon, for always making everything look good in the end. I appreciate your talent for attention to the details in the editing process.



### Next Issue's Spotlight



### *Pelvic Positioning and Cushion Selection*

### Contact Me!

Was this newsletter helpful? Are you interested in receiving future issues? Are you interested in contributing to this newsletter? Do you have any feedback or ideas about what you'd like to see in future issues?

If you answered YES to any of these questions then I would love to hear from you! Please call or email me with any feedback that you would like to share.

**Jennifer Birt, OT Reg MB**  
**Editor and Founder**  
**Specialized Seating Services**  
**RR160E-800 Sherbrook Street**  
**Winnipeg, MB R3A 1M4**

**Phone: 204-787-4266**

**Fax: 204-787-8637**

**Email: [jlbird@hsc.mb.ca](mailto:jlbird@hsc.mb.ca)**

